

HIGHLIGHTED ARTICLES

[Multi-century evaluation of recovery from strong precipitation deficits in California](#)

Journal of Climate (4.850)

[Assessing a long-standing conservation program: Mariner's perspectives on the right whale mandatory ship reporting system](#)

Marine Fisheries Review (1.25)

ADDITIONAL ARTICLES

NOS Publications

[Prioritizing seafloor mapping for Washington's Pacific Coast](#)

Sensors (Special Edition) (2.033)

[Sediment quality benchmarks for assessing oil-related impacts to the deep-sea benthos](#)

Integrated Environmental Assessment and Management (1.53)

[The environment as a driver of immune and endocrine responses in dolphins \(*Tursiops truncatus*\)](#)

Plos ONE (3.234)

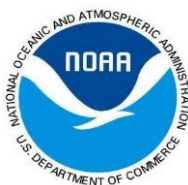
[Environmental perfluorooctane sulfonate \(PFOS\) exposure drives T cell activation in bottlenose dolphins](#)

Journal of Applied Toxicology (2.982)

NMFS Publications

[The distributed biological observatory: Linking physics to biology in the Pacific Arctic region](#)

Arctic (1.174)



[Applying species distribution modelling to a data poor, pelagic fish complex: The ocean sunfishes](#)

Journal of Biogeography (4.544)

[Characterization of annual salinity and temperature patterns in a large river delta to support tidal wetland habitat restoration efforts](#)

Northwest Science (0.412)

[The transition to independence: Sex differences in social and behavioural development of wild bottlenose dolphins](#)

Animal Behaviour (3.169)

[Age and method of release affect migratory performance of hatchery steelhead trout \(*Oncorhynchus mykiss*\)](#)

North American Journal of Fisheries Management (1.013)

[Socio-economic profile of the small-scale dive fishery in the commonwealth of Puerto Rico](#)

Marine Fisheries Review (1.25)

[Evaluating the best available social science for natural resource management decision-making](#)

Environmental Science & Policy (4.51)

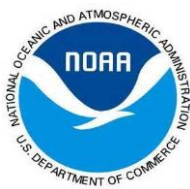
[The commercial trap fishery in the commonwealth of Puerto Rico: An economic, social and technological profile](#)

North American Journal of Fisheries Management (1.013)

[NESDIS Publications](#)

[On the climatological use of radar data mosaics: Possibilities and challenges](#)

Bulletin of the American Meteorological Society (11.808)



[Characterization of convective systems and their association with African easterly waves](#)

International Journal of Climatology (3.609)

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

NOS Publications

[Science plan for the Southeast Deep Coral Initiative \(SEDCI\): 2016-2019](#)

NOAA/NCCOS Technical Memorandum

[Application of the Coastal and Marine Ecological Classification Standard \(CMECS\) to deep-sea benthic surveys in the northeast Pacific: Lessons from field tests in 2015](#)

NOAA Technical Memorandum

HIGHLIGHTED ARTICLES

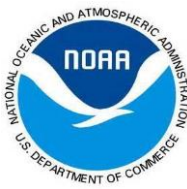
Multi-century evaluation of recovery from strong precipitation deficits in California

Journal of Climate (4.850)

E. R. Wahl, H. F. Diaz, R. S. Vose, W. S. Gross (NESDIS/NCEI)

- The Central Valley and South Coast drought during 2012-2015 was likely the most extreme dry event of this kind since at least 1571.
- Recovery times for the hardest hit areas may be decades.
- Precipitation variability by itself was sufficient to generate unprecedented dryness in the southern Central Valley and South Coastal regions of California during 2012-2015, without accounting for related temperature impacts.

The recent dryness in California was unprecedented in the instrumental record. This article employs spatially-explicit precipitation reconstructions for California in combination with instrumental data to provide perspective on this event since



1571. 2012-2015 stands out as particularly extreme in the southern Central Valley and South Coast regions, which likely experienced unprecedented precipitation deficits over this time, apart from considerations of increasing temperatures and drought metrics that combine temperature and moisture information. Some areas lost more than two years' average moisture delivery during these four years, and full recovery to long-term average moisture delivery could typically take up to several decades in the hardest-hit areas. These results highlight the value of the additional centuries of information provided by the paleo-record, which indicates the shorter instrumental record may underestimate the statewide recovery time by over thirty percent. The extreme El Niño that occurred in 2015-2016 ameliorated recovery in much of the northern half of the state, and since 1571 very strong-to-extreme El Niño's during the first year after a 2012-2015 type event reduce statewide recovery times by approximately half. The southern part of California did not experience the high precipitation anticipated, and the multi-century analysis suggests the north-wet/south-dry pattern for such an El Niño was a low-likelihood anomaly. Recent wetness in California motivated evaluation of recovery times when the first two years are relatively wet, suggesting the state is benefiting from a one-in-five (or lower) likelihood situation: the likelihood of recovery within two years is ~0.5% in the instrumental data and even lower in the reconstruction data.

Publication date: April 10, 2017

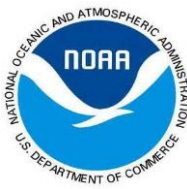
Available Online: <http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-16-0423.1>

Assessing a long-standing conservation program: Mariner's perspectives on the right whale mandatory ship reporting system

Marine Fisheries Review (1.25)

G. K. Silber (NMFS/OPR) and K. Wallmo (NMFS/OST)

- Measures established to protect living marine resources, including those for endangered marine species, are infrequently evaluated for effectiveness.
- Many survey takers indicated they comply with the reporting requirement; ships' operations may change to avoid whales; and the program is useful for educating captains and crew about right whales and important for right whale conservation. Others indicated the program is not useful in helping ships avoid right whales.



- Overall, views reflected in the survey suggest that the MSR program has provided positive conservation value through mariner outreach and education; however, not all mariners took specific strike avoidance action after having received the message.

Measures established to protect living marine resources, including those for endangered marine species, are only infrequently evaluated. In this paper we report findings of an online survey designed to solicit the views of maritime industries about a long-standing endangered large whale conservation program: the Mandatory Ship Reporting (MSR) system. The MSR was established in 1999 to aid in reducing the threat of vessel collisions with the highly depleted North Atlantic right whale, *Eubalaena glacialis*. Under MSR provisions, vessels ≥ 300 gross tons are required to report their location, speed, and destination when entering two key right whale aggregation areas. In return, reporting ships are sent an automated message about right whale vulnerability to ship collisions. The survey was intended to obtain views about the extent to which vessel operations were interrupted by the reporting requirement; how mariners utilize, if at all, information provided in the return message; whether vessel operations were modified in response to guidance provided; and the overall importance and effectiveness of the reporting systems in helping ships avoid right whale interactions. A total of 119 mariners with broad representation of vessel types and decades of experience at sea took part in the survey; 56 of these indicated they had entered one of the MSR areas at least once. Most (ca. 70%) indicated that they comply with the reporting requirement, distribute information on right whales and ship strikes to crew members, that they were more alert about avoiding/watching for right whales, and that the ship's operation may change to avoid an interaction. Of the survey-takers who had entered the system, about half indicated the MSR system is useful for educating captains and crew about right whales and important for right whale conservation, but only about a quarter indicated it is useful in helping ships avoid right whales. About 40% said it is an unnecessary requirement for ships. We conclude that as an outreach tool and a means to provide information directly to domestic and international mariners entering right whale habitat for over 15 years (thus, tens of thousands of ships entering these waters have received the



message), the MSR almost certainly has been beneficial in educating mariners about the issue of ship strike and in providing guidance on avoiding ship strikes. Views reflected in the survey suggest that, at least from the mariners' perspective, the MSR program has provided positive conservation value; however, not all mariners took specific strike avoidance action after having received the message. Acceptance date: March 2017

ADDITIONAL ARTICLES

NOS Publications

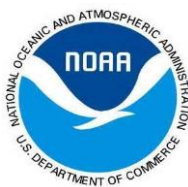
Prioritizing seafloor mapping for Washington's Pacific Coast

Sensors (Special Edition) (2.033)

T. Battista, K. Buja, J. Christensen (NOS/NCCOS), J. Hennessey, and K. Lassiter

- Federal and state strategic planning is more effective when requirements are known and clearly articulated and direct application of investments can be demonstrated.
- If conducted prudently and strategically, the investment in seafloor mapping will provide valuable return benefits, by promoting the availability of more complete information to aide in better planning and management of coastal resources.
- The seafloor mapping prioritization conducted in Washington State provides a successful process that can be utilized by other states and regions to aid and inform ocean mapping and decision-making.

Remote sensing systems are critical tools used for characterizing the geological and ecological composition of the seafloor. However, creating comprehensive and detailed maps of ocean and coastal environments has been hindered by the high cost of operating ship- and aircraft-based sensors. While a number of groups (e.g., academic research, government resource management, and private sector) are engaged in or would benefit from the collection of additional seafloor mapping data, disparate priorities, dauntingly large data gaps, and insufficient funding have



confounded strategic planning efforts. In this study, we addressed these challenges by implementing a quantitative, spatial process to facilitate prioritizing seafloor mapping needs in Washington State. The Washington State Prioritization Tool (WASP), a custom web-based mapping tool, was developed to solicit and analyze mapping priorities from each participating group. The process resulted in the identification of several discrete, high priority mapping hotspots. As a result, several of the areas have been or will be subsequently mapped. Furthermore, information captured during the process about the intended application of the mapping data was paramount for identifying the optimum remote sensing sensors and acquisition parameters to use during subsequent mapping surveys.

Publication date: March 28, 2017

Available online: <http://www.mdpi.com/1424-8220/17/4/701>

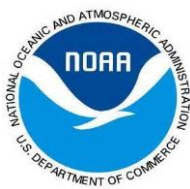
Sediment quality benchmarks for assessing oil-related impacts to the deep-sea benthos

Integrated Environmental Assessment and Management (1.53)

W. L. Balthis (NOS/NCCOS), J. L. Hyland (NOS/NCCOS), C. Cooksey (NOS/NCCOS), P. A. Montagna, J. G. Baguley, R. W. Ricker (NOS/ORR), C. Lewis

- Results suggest the likelihood of impacts to benthic macrofauna and meiofauna communities is low for total petroleum hydrocarbon (TPH). For total polycyclic aromatic hydrocarbons (PAHs), the probability of impacts is low for macrofauna and meiofauna respectively.
- It is anticipated that the resulting benchmarks will provide valuable screening tools for evaluating the biological significance of observed oil concentrations in similar deep-sea sediments following future spills and as potential restoration targets to aid in managing recovery.

Paired sediment contaminant and benthic infaunal data from prior studies following the 2010 Deepwater Horizon (DWH) oil spill in the Gulf of Mexico were analyzed using logistic-regression models (LRMs) to derive sediment-quality benchmarks for assessing risks of oil-related impacts to the deep-sea benthos. Sediment total Polycyclic Aromatic Hydrocarbon (PAH) and Total Petroleum



Hydrocarbon (TPH) concentrations were used as measures of oil exposure. Taxonomic richness (average number of taxa/sample) was selected as the primary benthic response variable. Data are from 37 stations (1300-1700 m water depth) in fine-grained sediments (92% - 99% silt-clay) sampled within 200 km of the DWH wellhead (most within 40 km) in 2010 and 32 stations sampled in 2011 (29 of which were common to both years). Results suggest the likelihood of impacts to benthic macrofauna and meiofauna communities is low for TPH. For total PAHs, the probability of impacts is low for macrofauna and meiofauna respectively. While numerical sediment quality guidelines (SQGs) are available for total PAHs and other chemical contaminants based on bioeffect data for shallower estuarine/marine and freshwater biota, to our knowledge none have been developed for measures of total oil (e.g., TPH) or specifically for deep-sea benthic applications. The benchmarks presented herein provide valuable screening tools for evaluating the biological significance of observed oil concentrations in similar deep-sea sediments following future spills and as potential restoration targets to aid in managing recovery.

Publication date: April 1, 2017

Available online: <http://onlinelibrary.wiley.com/doi/10.1002/ieam.1898/epdf>

The environment as a driver of immune and endocrine responses in dolphins (Tursiops truncatus)

Plos ONE (3.234)

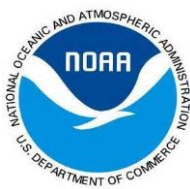
P. A. Fair, A. M. Schaefer, D. S. Houser, G. D. Bossart, T. A. Romano, C. D. Champagne, J. L. Stott, C. Rice, **N. D. White (NOS/NCCOS)**, J. S. Reif.

- We concluded that the environment shapes the immune and hormonal responses in dolphins.
- Many of the differences found between managed-care dolphins and wild dolphins are consistent with their cleaner environment and reduced antigenic stress. On the other hand, the biological significance of these differences cannot be determined and many of the statistically significant differences may not be accompanied by a biologically significant response or health effect.



- This research highlights the link between environment and health as it compares the health of dolphin populations housed in different environments. Dolphins housed in managed care environments are less likely to be exposed to the environmental stressors that wild dolphins face.

Endocrine hormones and immune responses play a critical role in allowing animals to adjust to environmental perturbations. We measured clinical, immune, and endocrine related markers in multiple samples from individuals from two managed care dolphin groups (U.S. Navy Marine Mammal Program (MMP) and Georgia Aquarium (GA) (n=82) and single samples collected from two wild dolphin populations (n=26 Indian River Lagoon (IRL); n=19 Charleston (CHS)). The immune systems of wild dolphins were more active than those of managed-care dolphins as shown by higher ‘baseline’ levels of immune response including higher IgG concentrations and increases in multiple immune components, including lysozyme, NK cell function, pathogen antibody titers and leukocyte cytokine transcript levels. Collectively, managed-care dolphins had significantly lower levels of transcripts encoding the two pro-inflammatory cytokines IL-17 and TNF, anti-viral MX1 and INF α and regulatory IL-10 . IL-2R α and CD69, markers of lymphocyte activation, were both lower in domestic dolphins. IL-4, a cytokine associated with TH2 activity, was lower in GA dolphins as compared to the free-ranging IRL and CHS dolphins. The differences found in the dolphins’ immune parameters appear to reflect differences in the environmental conditions under which these four dolphin populations live. Their habitats vary widely in environmental conditions (temperature, nutritional/forage, pathogen/toxin/contaminant exposures, predators, etc.). Many of the differences found were consistent with reduced antigenic insults in managed-care dolphins compared to wild dolphins. This would be consistent with the presence of relatively low TH2 lymphocyte activity and few circulating eosinophils in GA dolphins; both of these immunologic parameters are associated with immune responses to helminthic infections. Significant differences were also found in multiple hematological parameters with the same trend of managed-care dolphins being more similar than wild dolphins. Less consistent trends were observed in a suite of hormones (cortisol, ACTH, thyroid, aldosterone, catecholamines)



measured. While the underlying mechanisms are multiple and complex, the marked differences observed in the immune and endocrine systems of wild and managed-care dolphins are clearly shaped by their environment.

Acceptance date: March 17, 2017

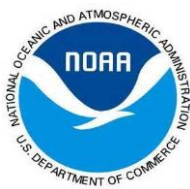
Environmental perfluorooctane sulfonate (PFOS) exposure drives T cell activation in bottlenose dolphins

Journal of Applied Toxicology (2.982)

A. Soloff, B. J. Wolf, **N. White** (NOS/NCCOS), D. Muir, S. Courtney, G. Hardiman, G. Bossart, P. Fair

- As an environmental contaminant, perfluorooctane sulfonate (PFOS) has been found to cause a range of health effects with some evidence that it impacts immune function.
- The results found that exposure to environmentally relevant levels of PFOS promoted pro-inflammatory cytokine production and proliferation in dolphins.
- These findings suggest PFOS directly dysregulates the dolphin cellular immune system and has implications for health hazards.
- Overall, with regard to dolphin health, we expect that exposure to PFOS might inhibit an animal's ability to mount a sufficient immune response when exposed to environmental stimuli.

Perfluoroalkyl acids (PFAAs) are highly stable compounds which have been associated with immunotoxicity in epidemiologic studies and experimental rodent models. Lengthy half-lives and resistance to environmental degradation result in bioaccumulation of PFAAs in humans and wildlife. Perfluorooctane sulfonate (PFOS), the most prevalent PFAA detected within the environment, is found at high levels in occupationally-exposed humans. We have monitored the environmental exposure of dolphins in the Charleston, SC region for over 10 years and levels of PFAAs, and PFOS in particular, are significantly elevated. As dolphins may serve as large mammal sentinels to identify the impact of environmental chemical exposure on human disease, we sought to assess the effect of environmental PFAAs on the adaptive immune system in highly-exposed



dolphins. Herein, we utilized a novel flow cytometry-based assay to examine T cell-specific responses to environmental PFAS exposure *ex vivo* and to exogenous PFOS stimulation *in vitro*. Baseline PFOS concentrations were associated with significantly increased CD4⁺ and CD8⁺ T cell proliferation from a heterogeneous resident dolphin population. Further analysis demonstrated that *in vitro* exposure to environmentally relevant levels of PFOS promoted pro-inflammatory cytokine production and proliferation in a dose-dependent manner. Collectively, these findings indicate that PFOS is capable of inducing pro-inflammatory interferon-gamma (IFN γ), but not immunoregulatory interleukin-4 (IL-4) production in T cells which may establish a state of chronic immune activation known to be associated with susceptibility to disease. These findings suggest that PFOS directly dysregulates the dolphin cellular immune system and has implications for health hazards.

Acceptance date: February 18, 2017

NMFS Publications

The distributed biological observatory: Linking physics to biology in the Pacific Arctic region

Arctic (1.174)

S. E. Moore (NMFS/OST) and J. Grebmeier

- Paper describes development phase of the first ecosystem-focused ocean observatory in the Arctic.
- Distributed biological observatory (DBO) sampling provides science relevant to Integrated Ecosystem Assessment of Pacific Arctic large marine ecosystems (LMEs).
- The DBO provides the basis upon which to build an international pan-Arctic network to provide standardized sampling of a marine ecosystem in rapid transition.

In 2009, in response to dramatic seasonal sea ice loss and other physical changes influencing biological communities, a Distributed Biological Observatory (DBO)



was proposed as a change detection array to measure biological responses to physical variability along a latitudinal gradient extending from the northern Bering Sea to the Beaufort Sea in the Pacific Arctic sector. In 2010, the Pacific Arctic Group (PAG) initiated a pilot program, focused on developing standardized sampling protocols in five regions of high productivity, biodiversity and rates of change. In 2012, an academic team received funding to sample all five DBO regions, with collateral support from the Interagency Arctic Research Policy Committee (IARPC) DBO Collaboration Team. The IARPC team met monthly from 2012-2016 and advanced the DBO from a pilot phase to an implementation phase, including the: (i) addition of three new sampling regions in the Beaufort Sea, (ii) goal of linking the observatory to existing community-based observation programs, and (iii) development of a plan for a periodic Pacific Arctic Regional Marine Assessment (PARMA) beginning in 2018. The long-term future of the DBO will depend on active involvement of international and national partners focused on the common goal of improved pan-Arctic assessments of regional marine ecosystems in an era of rapid change.

Acceptance date: April 4, 2017

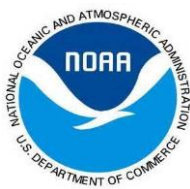
Applying species distribution modelling to a data poor, pelagic fish complex: The ocean sunfishes

Journal of Biogeography (4.544)

N. D. Phillips, N. Reid, T. Thys, C. Harrod, N. Payne, **C. A. Morgan**

(NMFS/NWFSC), H. J. White, S. Porter, and J. D. R. Houghton

- This study provides the first assessment of *Mola* distribution on a global scale, with evidence of a wide latitudinal range and significant clustering in localised hotspots (notably between 40-50°N).
- Assessing the results of species distribution modeling alongside evidence from published satellite tagging studies suggests that the species within the genus *Mola* are highly mobile, acting as facultative seasonal migrants.
- By identifying key suitable habitat alongside potential movement paths, this study provides a baseline that can be used in active conservation management of the genus.



Conservation management of vulnerable species requires detailed knowledge of their spatial and temporal distribution patterns. Within this context species distribution modelling (SDM) can provide insights into the spatial ecology of rarely encountered species and is used here to explore the distribution pattern of ocean sunfishes (*Mola mola* and *M. ramsayi*). Both species are prone to high levels of bycatch and are classified respectively as Globally Vulnerable and Not Assessed by the IUCN; although their overall range and drivers of distribution remain poorly defined. Here, we constructed suitable habitat models for *Mola* spp. on a global scale and considered how these change seasonally to provide a much needed baseline for future management.

Acceptance date: April 12, 2017

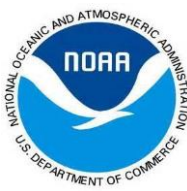
Characterization of annual salinity and temperature patterns in a large river delta to support tidal wetland habitat restoration efforts

Northwest Science (0.412)

J. E. Hall, T. P. Khangaonkar, **C. A. Rice**, **J. W. Chamberlin**, T. Zackey, F. E. Leonetti, M. Rustay, **K. L. Fresh**, **A. N. Kagley**, **M. Rowse** (NMFS/NWFSC)

- The study provides baseline information to measure restoration effectiveness.
- This study informs restoration prioritization through habitat characterization in the Snohomish River estuary.

While the Snohomish River estuary remains the second largest complex of vegetated tidal wetlands in Puget Sound, approximately 90% of pre-settlement habitat has been lost to diking and filling. The Snohomish River estuary is currently the focus of the largest estuary restoration effort in Puget Sound, with opportunity to restore tidal flooding to over 50% of pre-settlement levels. In addition, the Snohomish River currently supports wild populations of all anadromous Pacific salmon, including Endangered Species Act (ESA) listed Chinook (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), as well as bull trout (*Salvelinus confluentus*). The combination of extant fish populations, relatively large extent of existing tidal wetlands relative to other Puget Sound river deltas, and the greatest potential to restore large areas of tidal wetland habitat make the



Snohomish River estuary a great opportunity to use estuary restoration to benefit the conservation and recovery of Puget Sound salmon populations. To support restoration planning and effectiveness monitoring efforts, we have developed baseline characterizations of key physical attributes (salinity and temperature) across the full extent of the Snohomish River estuary. Our results indicate that estuarine conditions extend farther into the estuary than previously described, with salinities exceeding oligohaline conditions throughout the lower Mainstem, Ebey, Union, and Steamboat Sloughs and within upper Steamboat and Union Sloughs throughout most of the year. We also observed temperatures that exceed stress thresholds for juvenile salmonids throughout the estuary from May through September, a period that overlaps with juvenile salmonid rearing in the estuary. However, increasing average temperatures were generally positively correlated with increasing spatial heterogeneity, which could provide thermal refugia within the system. The products of this research are timely in that several large restoration projects are scheduled to breach between 2015 and 2020, and this will serve as a baseline from which hydrological and biological responses can be evaluated for these projects and projects throughout the Snohomish River estuary.

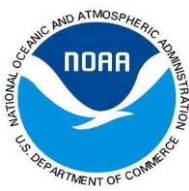
Acceptance date: March 25, 2017

The transition to independence: Sex differences in social and behavioural development of wild bottlenose dolphins

Animal Behaviour (3.169)

E. Krzyszczyk, **E. M. Patterson (NMFS/OPR)**, M. Stanton, J. Mann

- Different hypotheses were tested with regards to sex differences in behavioural development among calf and juvenile bottlenose dolphins.
- Juvenile bottlenose dolphins exhibit distinct behavior from that of adults and calves, with some sex differences, which may require age-specific management practices.
- Only females increase foraging rates between infancy and juvenility, which is higher than adult rates recorded, and juvenile females are more averse to the presence of adult males.



Sex differences in adult behaviour are well documented, but less is known about the ontogeny of these differences. In mammals, the transition to independence, from infancy to the juvenile period, is when these sex differences are likely to become prominent. Here, we examined sex differences in behavioural development among calf and juvenile bottlenose dolphins (*Tursiops aduncus*) from two years pre-weaning to two years post-weaning and whether these differences were consistent, or not, with three non-mutually exclusive hypotheses regarding the function of the juvenile period: the social skills, protection/safety, and energy allocation hypothesis. All hypotheses received some support, but strikingly so for females. First, sex differences in the nature and quality of juvenile social bonds appear to foreshadow adult association patterns. Juveniles had a greater proportion of same-sex associates than calves. Second, although neither sex increased their number of associates from infancy to juvenility, a pattern that might mitigate predation risk, avoidance between juveniles and adult males suggests that both sexes reduce the likelihood of conspecific aggression. This pattern was more marked for juvenile females. Third, females, but not males, increased foraging rates from late infancy to the early juvenile period, even surpassing typical adult female foraging rates. This is likely related to the future energetic demands of maternal investment and skill development required for specialized foraging tactics, which are female biased in this population. This study provides a first step towards understanding the transition into independence for cetaceans, insight into how sex differences develop and a glimpse into the function of the juvenile period. Acceptance date: April 10, 2017

Age and method of release affect migratory performance of hatchery steelhead trout (Oncorhynchus mykiss)

North American Journal of Fisheries Management (1.013)

C. P. Tatara, M. R. Cooper, W. Gale, B. M. Kennedy, C. R. Pasley, **B. A. Berejikian** (NMFS/NWFSC)

- Demonstrates age-2 rearing practices for natural origin steelhead broodstocks produce equivalent or better survival when compared to traditional rearing practices.



- Age-2 steelhead smolts migrated to the ocean faster than age-1 steelhead smolts.
- Describes culture parameters needed to produce age-2 steelhead in supplemental materials.

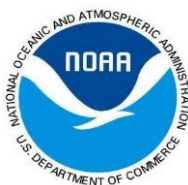
Hatchery programs for anadromous salmonids, including steelhead trout *Oncorhynchus mykiss* that are designed to aid recovery of natural populations require locally-derived, natural-origin broodstock. In such programs, achieving smoltification size thresholds may require extending hatchery rearing beyond age-1. We compared outmigration survival and travel rate of 142,990 age 1 (S1) and age 2 (S2) steelhead smolts implanted with passive integrated transponder (PIT) tags over five release years at Winthrop National Fish Hatchery (WNFH, Okanogan County, WA). A S2 rearing cycle produced larger smolts with more uniform size distributions, resulting in higher survival during the first portion of their outmigration than S1 smolts in three of five release years. The S2 smolts migrated more rapidly to the ocean than S1 smolts in all years except 2011, and arrived in the Columbia River estuary an average of 5.4 days earlier than the S1 smolts. S1 steelhead that did not leave during the volitional release were subsequently forced from the hatchery to measure their survival. These fish were smaller and had survival rates that were 2.3 to 66.3 times lower than S1 steelhead that left the hatchery on their own. The same was true for S2 steelhead, but the magnitude of the survival difference between migrants and fish forced from the raceways was less variable and ranged from 2.5 to 4.6 fold. We conclude that S2 rearing can be a successful strategy for producing smolts from local natural-origin broodstock with outmigration survival and travel times that are equivalent or better than those of S1 smolts produced from nonlocal broodstock.

Acceptance date: March 31, 2017

Socio-economic profile of the small-scale dive fishery in the commonwealth of Puerto Rico

Marine Fisheries Review (1.25)

J. Agar (NMFS/SEFSC) and M. Shivlani



- This study provides the first comprehensive socio-economic profile of the small-scale dive fishery which will assist the Caribbean Fishery Management Council in decision-making.
- The study revealed that the fishery is composed of small-scale commodity producers who use labor intensive, low technology capital to catch high valued species.

This study provides the first comprehensive socio-economic profile of the small-scale dive fishery which is the most valuable commercial fishery in the Commonwealth of Puerto Rico. The study revealed that the fishery is composed of small-scale commodity producers who use labor intensive, low technology capital to catch high valued species such as queen conch (*Strombus gigas*), spiny lobster (*Panulirus argus*), various reef-fish (Labridae, Scaridae, Lutjanidae), and octopus (Octopodidae). The average dive operation had a 20 ft, 76 hp fishing boat with 2-3 crew members. Diving operations fished 5 times a week for about 7 hs. After deducting nonlabor running costs, dive operations netted about \$170 per trip. Fuel expenses accounted for about 61% of the nonlabor variable costs. Most of the crew members were non-kin because of the hazardous nature of diving which favors recruitment decisions based on skill and compatibility rather than kinship relationships. However, fishermen reported that diving accidents were not rare occurrences. Economic pressures and operational carelessness (rather than ignorance about diving risks) were cited as the main factors behind the accidents. Fishermen exhibited a high degree of occupational fidelity. Income sharing arrangements between boat owners and crew were found to be fairly egalitarian. The article underscores the need to explicitly consider safety at sea concerns when assessing the impact of management proposals.

Acceptance date: February 13, 2017

Evaluating the best available social science for natural resource management decision-making

Environmental Science & Policy (4.51)



M. R. Poe (NMFS/NWFSC), K. C. Norman (NMFS/NWFSC), J. Donatuto, M. B. Mascia, S. J. Breslow (NMFS/NWFSC), X. Basurto, C. Hicks, C. Garcia-Quijano, K. St. Martin, A. Agrawal, N. Dolsak, P. S. Levin

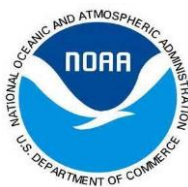
- Provides guidance for managers and natural scientists interested in assessing and incorporating social science into natural resources policy.
- Provides a case study to highlight how social science may be evaluated and incorporated.

Increasing recognition of social-ecological systems as being integrated, and of conservation as concerning both people and nature, highlights the importance of applying social science to natural resource management decision-making. Moreover, a number of laws and regulations require natural resource managers to consider the “best available science” when making decisions, including social science. Yet definitions and standards for “best available science” are sparse, particularly in the case of best available social science (BASS). This paper offers some definitions and standards for BASS, emphasizing qualitative social science methods and data, and explains why a broader set of standards than those used for natural science is needed. We also provide two case examples from the USA – one from the National Marine Fisheries Service and one from the U.S. Forest Service – of how these federal agencies have attempted to integrate BASS into natural resource management. We find that the natural and social sciences share many of the same scientific standards for quality, but also exhibit some differences, especially where qualitative social science is concerned. Thus we argue that the standards of evidence for evaluating best available science should expand to include those associated with the qualitative social sciences in particular. Greater attention to including BASS in natural resource management decision-making can contribute to better, more equitable, and more defensible management decisions and policies.

Acceptance date: April 6, 2017

The commercial trap fishery in the commonwealth of Puerto Rico: An economic, social and technological profile

North American Journal of Fisheries Management (1.013)



J. Agar (NMFS/SEFSC), M. Shivilani, and D. Solis

- The analysis suggested that trap operations could, on average, increase their gross revenues per trip by 36% using current input levels and technology more efficiently.
- The analysis suggested that fishing experience and kinship ties were the key determinants of technical efficiency.

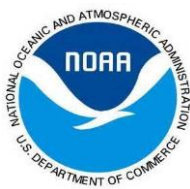
This paper describes the socio-economic conditions of the small-scale trap fishery in the Commonwealth of Puerto Rico and examines the determinants affecting the technical performance of the fleet. The socio-economic data used in the analysis was derived from 50 random, in-person interviews with trap fishers, which accounted for about one-third of the active trap fishers. The study found that the fishery is composed of middle-aged, small-scale commodity producers who use traditional, capital intensive technologies to target spiny lobsters and various reef-fishes. Fishers reported that fishing made up 74% of their household income. The study also explored the factors influencing the technical efficiency of the fleet using a stochastic production frontier model. The analysis suggested that trap operations could, on average, increase their gross revenues per trip by 36% using current input levels and technology more efficiently. The fleet exhibited decreasing returns to scale. The study also found that a 10% increase in the amount of traps tended would raise gross revenues by 0.9% and that baiting traps would raise gross revenues by 1.4%. The analysis suggested that fishing experience and kinship ties were the key determinants of technical efficiency. The paper also explored the policy implications stemming from these results.

Acceptance date: April 6, 2017

NESDIS Publications

On the climatological use of radar data mosaics: Possibilities and challenges
Bulletin of the American Meteorological Society (11.808)

F. Fabry, V. Meunier, B. P. Treserras, A. Cournoyer, **B. Nelson (NESDIS/NCEI)**



- The location of radar with respect to the features of interest, data availability, terrain blockage, ground clutter, and the vertical profile of reflectivity all introduce biases and other artifacts in the radar data.
- United States composites of radar data from 1996-2015 are used to demonstrate a number of possibilities offered by radar datasets- from climatologies of precipitation to spatial distribution of convection.

Continental composites of radar data have now been generated for more than twenty years. These offer information on precipitation climatology that is simply not available or archived elsewhere: How often does it rain at any particular location? At what time? And with what intensity distribution? What are the geographical and temporal patterns of precipitation occurrence, formation, and decay? What is the climatology of severe weather? Answers to these questions have value on their own and also invariably trigger more questions about the processes causing these patterns as well as suggest some answers. They also have considerable pedagogical value to illustrate in the classroom the impacts on precipitation of different processes such as sea-land breezes, topography, and seasons. In this work, U.S. composites of radar data from 1996 to 2015 are used to demonstrate the possibilities offered by such a data set. Three topics are touched: a) climatologies and daily cycles of precipitation and convection, and what they can teach us about precipitation mechanisms; b) the spatial and temporal distribution of the appearance and occurrence of convection, and what it reveals on the importance of surface terrain properties for these events; and c) the power and challenges of looking for a small signal in even such a large dataset using the influence of weekly activity cycles and of cities on precipitation as an illustration.

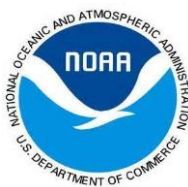
Publication date: March 21, 2017

Available online: <http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-15-00256.1>

Characterization of convective systems and their association with African easterly waves

International Journal of Climatology (3.609)

H. Semunegus, A. Mekonnen, C. Schreck (NESDIS/NCEI)



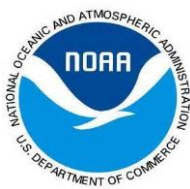
- This study provided new insights into how African easterly waves are forced by convection over East Africa and a unique perspective of how the mode of convection changes in association with easterly waves across tropical North Africa starting from the Ethiopian Highlands.
- This knowledge can be used to better understand mesoscale convective systems development over tropical North Africa, which have potential to develop into North Atlantic hurricanes that can impact the United States.

This study investigates the relationship between African easterly waves (AEWs) and different types of deep convection. It is known that AEWs impact the development of deep convection over tropical North Africa and tropical cyclone formation over the eastern Atlantic. However, the process of how AEWs interact with deep convection is not well understood. Composite analysis based on a 24-year dataset of Cloud Systems (CS) from the International Satellite Cloud Climate Project (ISCCP) shows that the relationship changes with various types of convection over this region. This phase change relationship analysis may shed light into the dynamics of AEWs and improve the ability of forecasters to anticipate associated rainfall over the Sahel. Weak and disorganized convective systems (WDCSs; $50 \text{ km} < \text{radius} < 100 \text{ km}$) are most common within the southerly-phase of the AEWs over East Africa. Mesoscale Convective Systems (MCSs) with cloud radii $> 100 \text{ km}$ increase in frequency within and to the west of the AEW-trough zone. MCSs are common features of summer in northwestern Africa. Our results indicate that the association between AEWs and deep convection is different and changes across North Africa. Weak AEWs over East Africa have a stronger relationship with WDCSs, while mature AEWs over West Africa have more MCS activity. This evolution suggests that the organization of convection from WDCS to MCS may play a critical role in AEW development. This hypothesis contrasts the traditional view that treats convection uniformly.

Acceptance date: March 15, 2017

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

NOS PUBLICATIONS



Science plan for the Southeast Deep Coral Initiative (SEDCI): 2016-2019

NOAA/NCCOS Technical Memorandum

D. Wagner (NOS/NCCOS), P. J. Etnoyer (NOS/NCCOS), J. Schull (NMFS/SEFSC), A. W. David (NMFS/SEFSC), M. S. Nizinski (NMFS/OST), E. L. Hickerson (NOS/ONMS), T. A. Battista (NOS/NCCOS), A. N. Netburn (OAR/OER), S. L. Harter (NMFS/SEFSC), G. P. Schmahl (NOS/ONMS), H. M. Coleman (NMFS/OHC) & T. F. Hourigan (NMFS/OHC)

- This science plan outlines a general strategy for the execution of the most important research activities to be conducted under Southeast Deep Coral Initiative
- The plan includes a series of research expeditions and complementary research projects.

In 2016, NOAA's Deep Sea Coral Research and Technology Program (DSCRTP) began a new four-year research initiative that seeks to collect scientific information needed to manage deep-sea coral ecosystems throughout the southeastern U.S., a region including the federal waters of the U.S. Caribbean, South Atlantic and Gulf of Mexico. As a first step towards launching this new research initiative, the DSCRTP and the Southeast Fisheries Science Center conducted a science priorities scoping workshop that brought together experts from NOAA, fishery management councils, the Bureau of Ocean and Energy Management (BOEM), the U.S. Geological Survey (USGS), academic institutions and others. The workshop laid the foundation for the development of a science plan for the initiative, known as the Southeast Deep Coral Initiative (SEDCI). The purpose of this science plan is to outline a general strategy for the execution and completion of the most important research activities conducted under SEDCI. While we acknowledge that this science plan is a living document, and that some of its details will inevitably change throughout the initiative, the plan outlines the general approach and activities that will be conducted by SEDCI.

Publication date: March 2017

Available online:

https://data.nodc.noaa.gov/coris/library/NOAA/DSCRTP/Other/Wagner2017_SEDCI_Science_Plan.pdf



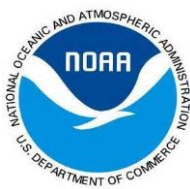
Application of the Coastal and Marine Ecological Classification Standard (CMECS) to deep-sea benthic surveys in the northeast Pacific: Lessons from field tests in 2015

NOAA Technical Memorandum

R. D. Bassett (NOS/NCCOS), M. Finkbeiner (NOS/OCM), P. J. Etnoyer (NOS/NCCOS)

- Coastal and Marine Ecological Classification Standard (CMECS) geoform and water column components can be incorporated by benthic survey field teams with little modification to standard operating procedures.
- Geo-position, depth, temperature, salinity, and oxygen are routinely collected in the field.
- The values can be converted to CMECS categories by “crosswalk” procedures. The water column component uses categorical definitions that need consideration, because similar categories in different regions use different ranges of values.

The Coastal and Marine Ecological Classification Standard (CMECS) is a comprehensive, standard terminology published in 2012 by the Federal Geographic Data Committee (FGDC). The Standard is intended to unify habitat classification efforts, in order to allow for broader integration and comparison of data. The standard is well-developed, but has not been tested extensively in the deep sea. NOAA has set a milestone to adopt best practices and standards, such as CMECS, within NOAA's Integrated Ocean & Coastal Mapping Program since 2013, so there is a timely need for guidance directed toward the deep-sea research community about how to apply this standardized methodology. This report summarizes the findings from a short research project that engaged field teams during three deep-sea benthic surveys in the US Pacific in 2015, including telepresence cruises in California and Hawaii. The researchers conducted post-cruise analyses to process images from surveys aboard NOAA Ship Okeanos Explorer, E/V Nautilus from Ocean Exploration Trust, and R/V Shearwater from the NOAA Office of National Marine Sanctuaries. Thirty-two remotely operated vehicle dives and more than 6,400 still images were analyzed using a simple CMECS annotation. The report



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 24, 2017

considered three of the four CMECS components — geoform, water column, and substrate.

Publication date: February 2017

Available online:

https://drive.google.com/open?id=0BwaK_po4k5XBSFAza182djFORVE